

Hypothesis Testing for a Population Proportion Checkpoint

Question (1)

Does second-hand smoke increase the risk of a low birthweight? A baby is considered have low birthweight if he/she weighs less than 5.5 pounds at birth. According to the National Center of Health Statistics, about 7.8% of all babies born in the U.S. are categorized as low birthweight. Suspecting that the national percentage is higher than 7.8%, researchers randomly select 1200 babies whose mothers had extensive exposure to second-hand smoke during pregnancy and find that 10.4% of the sampled babies are categorized as low birth weight. Let p be the proportion of all babies in the U.S. that are categorized as "low birth weight". Give the null and alternative hypotheses for this research question.

A:

$$H_0 : p = 0.078$$

$$H_a : p \neq 0.078$$

B:

$$H_0 : p = 0.078$$

$$H_a : p > 0.078$$

C:

$$H_0 : p = 0.104$$

$$H_a : p \neq 0.104$$

D:

$$H_0 : \mu = .078$$

$$H_a : \mu > .078$$

Feedback**A : 0**

- ✗ Not quite right: The null hypothesis is correct. The researchers want to compare the proportion of low weight births for women exposed to second-hand smoke during their pregnancies to 0.078. However, they want to know if this proportion is greater than 0.078. The correct answer is (B).

B : 10

- ✓ Good job! The researchers want know if the proportion of low weight births for women exposed to second-hand smoke during their pregnancies is greater than 0.078.

C : 0

- ✗ Incorrect: You used the sample proportion to create the hypotheses. We do not use sample data to create the hypotheses. The researchers want know if the proportion of low weight births for women exposed to second-hand smoke during their pregnancies is greater than 0.078. The correct answer is (B).

D : 0

- ✗ Incorrect: You used the sample proportion to create the hypotheses. We do not use sample data to create the hypotheses. The researchers want know if the proportion of low weight births for women exposed to second-hand smoke during their pregnancies is greater than 0.078. The correct answer is (B).

Question (2)

A quality control engineer at a potato chip company tests the bag filling machine by weighing bags of potato chips. Not every bag contains exactly the same weight. But if more than 15% of bags are over-filled then they stop production to fix the machine. They

define over-filled to be more than 1 ounce above the weight on the package. The engineer weighs 100 bags and finds that 21 of them are over-filled. He plans to test the hypotheses $H_0: p = 0.15$ versus $H_a: p > 0.15$ (where p is the true proportion of overfilled bags).

What is the test statistic?

A: $Z = 1.68$

B: $Z = -1.68$

C: $Z = 4$

D: $Z = -1.47$

Feedback

A : 10

✓ Good job! The sample proportion is about 1.68 standard errors above the $p = 0.15$.

B : 0

✗ Not quite right: It looks like you switched the order of the sample proportion and the population proportion in the numerator. The correct answer is (A).

C : 0

✗ Incorrect: It looks like you did $p(p)$ rather than $p(1 - p)$ The correct answer is (A).

D : 0

✗ Incorrect: It looks like you switched the value of the sample proportion and the population proportion in the formula. You should use 0.15 for p and 0.21 for p -hat. The correct answer is (A).

Question (3)

According to a Pew Research Center, in May 2011, 35% of all American adults had a smart phone (one which the user can use to read email and surf the Internet). A communications professor at a university believes this percentage is higher among community college students. She selects 300 community college students at random and finds that 120 of them have a smart phone. In testing the hypotheses $H_0: p = 0.35$ versus $H_a: p > 0.35$, she calculates the test statistic as $Z = 1.82$. Use the Normal Table to help answer the p-value part of this question.

Click [here](#) to access the normal table.

A: There is enough evidence to show that more than 35% of community college students own a smart phone (P-value = 0.034).

B: There is enough evidence to show that more than 35% of community college students own a smart phone (P-value = 0.068).

C: There is not enough evidence to show that more than 35% of community college students own a smart phone (P-value = 0.966).

D: There is not enough evidence to show that more than 35% of community college students own a smart phone (P-value = 0.034).

Feedback

A : 10

✓ Good job! The area to the right of $Z = 1.82$ on the standard normal curve is about 0.034. This is smaller than $\hat{p} \pm 0.10$ so we reject the null hypothesis and accept the alternative.

B : 0

✗ Not quite right: You doubled the correct P-value. We double the P-value when the test is two-sided. The test is two-sided when the alternative hypothesis uses the inequality $\hat{p} \neq p_0$. The conclusion is correct. The correct answer is (A).

C : 0

✗ Not quite right: You used the area to the left of $Z = 1.82$ as your P-value. Because the alternative hypothesis is $p > 0.35$, we use

X the area to the right of the test statistic as the P-value. The P-value is 0.034 which also means we would reject the null hypothesis for our conclusion. The correct answer is (A).

D : 0

X Not quite right: Although your P-value is correct, your conclusion is not correct. The P-value is smaller than $\hat{p} \pm 0.10$ so we reject the null hypothesis and accept the alternative. The correct answer is (A).